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Battelle

Columbus Laboratories

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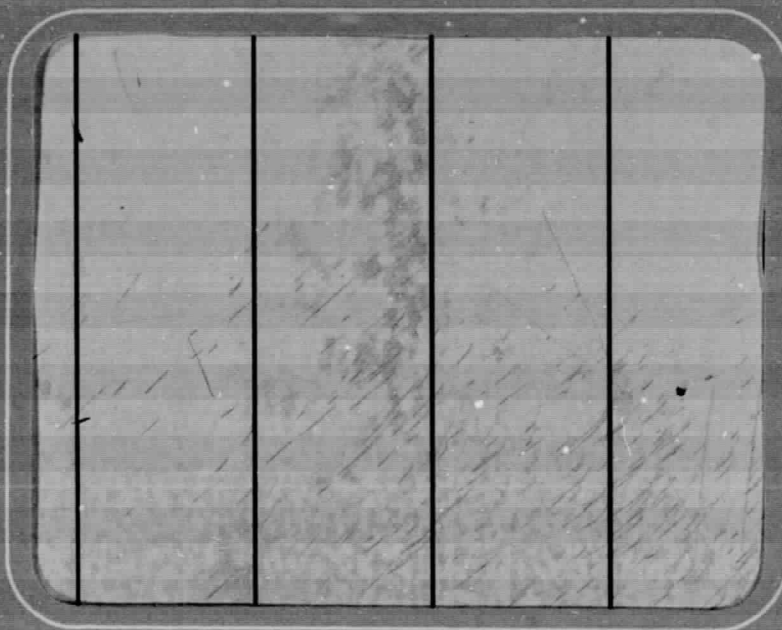
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Report



SUPPLEMENTARY
FINAL REPORT

on the

STS PILOT USER DEVELOPMENT PROGRAM

to

NATIONAL AERONAUTICS AND SPACE
ADMINISTRATION HEADQUARTERS
WASHINGTON, D.C.

June 30, 1977

CONTRACT NUMBER NASw-2964

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PREFACE

This Battelle report, entitled "Supplementary Final Report on the STS Pilot User Development Program", is submitted under NASA Contract No. NASw-2964. An initial final report was submitted to NASA on March 31, 1977, documenting the 9-month pilot contact portion of the STS Pilot User Development Program. This supplementary final report documents an extension of the Pilot Program, requested by NASA, to permit Battelle to support the NASA Space Transportation System (STS) team at the Paris Air Show in June 1977. This report, therefore, describes the planning and preparation for and the participation in the Paris Air Show by Battelle's Columbus Laboratories (BCL) personnel.

Battelle would like to acknowledge the efforts of Jon Michael Smith of NASA Headquarters, Code MOP, as the Contracting Officer Representative for the Pilot Program. The following BCL staff are recognized for their contribution to this report:

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SUPPLEMENTARY FINAL REPORT
on the
STS PILOT USER DEVELOPMENT PROGRAM

to
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
HEADQUARTERS, WASHINGTON, D.C.

from
BATTELLE
Columbus Laboratories
Contract Number NASw-2964

June 30, 1977

INTRODUCTION

The Space Transportation System (STS) is steadily evolving toward an operational reality to eventual users. To current space users the STS will represent a less costly, more frequent transportation system to space as a replacement for the existing expendable launch vehicles (ELVs). To potential new users, the STS will represent a wide variation of innovative opportunities in space research and, ultimately, routine commercial space operations. Full exploitation of the STS capabilities and achievement of the projected utilization of the system will be not only dependent on extensive use of the STS for currently conventional space applications and research, but also on new uses originating from current and new users.

Over the past 4 years, NASA has sponsored several studies to explore how best to conduct the development of new uses and new users of the STS. The most recent user development effort is the current Pilot User Development Program under contract to Battelle's Columbus Laboratories. The Pilot Program, intended as the first step in full-scale user development for the STS, addressed the urgent need to develop

the current space user first. The program approach involved conducting pilot contacts with a sample of current space users to make them aware of the STS and to encourage early transitioning from ELVs to the STS. The results of the pilot contacts were to be evaluated and, collectively, provide the basis for preparation of a Full-Scale STS User Development Plan. The pilot contact portion of the Pilot Program has been completed. A final report on the 9-month program was submitted to NASA on March 31, 1977. In addition, a report was submitted to NASA in March 1977 describing a recommended plan to implement a full-scale user development program for the STS. That report consisted of two volumes as specified below:

Volume I - Executive Summary of the Full-Scale STS
User Development Program Plan, Revision 1,
dated March 25, 1977

Volume II - Full-Scale STS User Development Program
Plan, dated March 8, 1977.

A briefing on the results of the Pilot Program and on the recommended full-scale plan was given to the Space Transportation System User Service Council at NASA Headquarters on May 17, 1977.

The Pilot Program was initially designed so that a selection of current space users in the U.S. commercial and foreign commercial fields would be contacted, and then, based on the results of these selected contacts, a full-scale plan would be developed for contacting the remaining larger group of both U.S. and foreign commercial users of space as potential users of the STS. At approximately mid-term in the program it was determined by NASA that it would not be timely to try and carry out proposed contacts with selected foreign users of space. Additional domestic user contacts were, therefore, made in lieu of the foreign contacts. Near the completion of the program NASA decided that the Paris Air Show in June 1977 would provide a significant opportunity for contacting and briefing foreign users. Subsequently, the Pilot Program was extended by NASA to cover Battelle's participation in the planning and preparation for the Air Show and attendance as part of the NASA/STS team from June 2-11, 1977, in Paris. This supplementary final report, therefore, describes the planning and preparation activities and the results of the briefings associated with the Paris Air Show.

PARIS AIR SHOW PLANNING/PREPARATION

NASA/STS Paris Air Show Plan

The overall approach taken by NASA for the Paris Air Show was to have a team of key personnel available during the show to familiarize international users with the STS program and the Space Shuttle capabilities. The primary goals of the NASA/STS team were to explore with potential users the mechanisms by which they can most effectively utilize the STS and to identify how NASA can be more responsive to user needs.

Participation at the Air Show was to include the operation of an STS booth at the U.S. Pavilion, the presentation of several invitational briefings, and detailed discussions with individual organizations. The STS booth, designed by NASA JSC, was to provide public access to current Shuttle information and to serve as a central point of contact for the NASA team and the arrangement for more detailed discussions.

The invitational briefings were to include a presentation to a large audience (250) at the U.S. Pavilion on June 8 and several smaller (50-60) audience briefings throughout the week of June 6-10. The June 8 briefing, involving both NASA and the European Space Agency (ESA), would deal with the progress of the STS and the ESA-developed Spacelab and would focus on user-oriented aspects of the system with special emphasis on the pricing policy. The other briefings would, in general, follow that outline, but could be tailored to address the special interests of invited organizations.

Preparation

Battelle supported NASA JSC in designing the briefing material and structuring the briefings. An objective was to emphasize confidence in the STS program, establish schedule credibility, and eliminate policy and cost uncertainties. All briefing material was prepared using 35mm slides and was organized into the following categories:

- Section 1 - STS operations overview: Space Shuttle development status, schedules, operation
- Section 2 - Spacelab
- Section 3 - Upper stages
- Section 4 - Free fliers
- Section 5 - User interface through flight assignment process (includes pricing policy data)
- Section 6 - Space flight background, history, statistics.

The organization of the briefing material (slides) into these categories, with each slide numbered in sequence within each section, was documented by JSC in a briefing material brochure. Overall this approach was designed to provide flexibility and effective response to briefing needs on a daily basis. Each briefing could be tailored by selecting different combinations of slides to emphasize specific interest areas.

One of the special briefings scheduled for Paris was a presentation by the Associate Administrator for the Office of Space Flight to the London Financial Times Colloquium on May 31. A paper on the STS was prepared by Battelle for this briefing.

As a result of the previous favorable response to the STS overview film used in the pilot contacts it was decided to revise that film to update it for the Paris Air Show briefings. The revised film includes new artwork showing the updated orbiter configuration with the new thermal protection configuration around the nose, windows, etc. In addition, the film shows new material on the Long Duration Exposure Facility (LDEF), revised sequences on the Spacelab and captive flight testing of Orbiter 101 with the Boeing 747 carrier aircraft.

Preparation for the Air Show also included provision of support to NASA in preparing a list of key organizations to which invitations could be sent for the briefings. Several international organizations and individuals were provided to NASA for the overall list. The actual invitation was structured to create interest, on an individual basis, in gaining more personalized information on the STS.

RESULTS

General

In the view of Battelle, NASA participation in the Paris Air Show was successful; the goals previously established as a basis for justifying NASA participation in the Show were effectively achieved. The NASA/Battelle team had significant opportunities to meet and interface with a wide spectrum of organizations and, in many cases, were able to explore in depth the potential roles of users in space utilizing the Shuttle. Of particular interest was the opportunity to interface with U.S. aerospace company representatives attending the show for aircraft sales purposes. Meeting with individuals in these companies (Rockwell-International, McDonnell Douglas, Bendix, United Technologies, TRW, Boeing, Lockheed) provided the means for discussing space involvement and STS applications across the multi-interest product lines of each company. This led to commitments to further explore specific interests within the parent organizations. Strong indications of early commitments to purchase small, self-contained payloads were made by at least two organizations.

Interfacing with foreign organizations was, in general, beneficial in providing them with much sought after material on the Shuttle. To many Europeans the Space Shuttle is only the Spacelab. Many technical publication personnel from France, Switzerland, the Netherlands, Denmark and Italy were provided with handout packages of STS descriptive material for future publication. It was also found that, while most European countries see the European Space Agency (ESA) as necessary and beneficial to their participation in space programs, some are considering independent roles for Spacelab use, experiment integration or operations. There also appears to be concern among some of the ESA member nations as to what the European country role will be, as compared to the U.S., regarding the operations of the operational Spacelab. The interface with BAC, British Aircraft Corporation, Ltd. (a British Aerospace Company now, since England's nationalization of their aerospace industry), was of particular interest and is reported separately in this report.

Booth Operation

The NASA/STS booth operations, although compromised by location, served effectively as a central point for distribution of STS information to the public. Of secondary importance, the booth also provided a focal point for the NASA team activities. Handout material prepared by NASA was supplemented by Shuttle material supplied by Rockwell. About 1000 copies of all the material were passed out. The Shuttle decals and the Skylab medallion (part of which flew in space) proved to be significantly effective as drawing cards to the booth. Although some detailed discussions took place at the booth, its location in a businessman's area of aircraft component and subsystem suppliers in the U.S. Pavilion compromised the potential of the space systems-oriented Shuttle booth. There appeared to be continual confusion on the part of both the public and the office of the U.S. Department of Commerce as to which area represented NASA, since the Shuttle was displayed in the U.S. Pavilion theme area, the STS was concentrated in the booth which was completely separate, and the CV-990 aircraft outfitted with the Shuttle ASSESS II instruments was in the aircraft static display area. Overall, however, the operation of the booth ran smoothly and contributed greatly, through personal discussions and prepared handout material, to promotion of the STS.

Major STS Briefing

A major briefing on the STS had been planned in the U.S. Pavilion on June 8, 1977, as a result of invitations previously sent out to key organizations in Europe. Although responses to the invitations indicated a large number of intended attendees, there was some apprehension prior to the briefing because of the less than optimum briefing time, 3:30 p.m., and the known competition of many other activities at the Air Show. The briefing, however, was very well attended (see Appendix A for a list of attendees), and represented a very successful interface with the European countries. Representatives from various entities in 11 different countries and from the U.S. attended. There were also four representatives from the USSR, although their names do not appear on the attendee list.

Many top level management personnel were in attendance, some of whom came as a direct result of previous discussions at the NASA booth.

The briefing was given by Capt. C. M. Lee, Capt. Alan Bean, Michel Bignier (Director, Spacelab Program - ESA) and J. M. Smith, and covered the STS program overview and status, Spacelab and pricing policy. Most of the questions that followed were to obtain clarification or more information on what was presented.

Planned smaller briefings did not materialize. The major briefing on June 8 probably represented the majority of interested groups at this point in time.

British Aircraft Corporation (BAC)

The BAC was contacted at the start of the Air Show as a follow-up to a previous contact with BAC's Jeff Crowder, Chief Systems Engineer, at the International Astronautical Federation (IAF) Congress in Anaheim, California, in October 1976. At that time an extensive discussion of the small self-contained payloads was held with Crowder as applicable to sounding rocket missions. It was agreed then that BAC would be included in planned European pilot contacts. These contacts were not implemented during the Pilot Program, however. It was found, upon contacting the BAC booth at the Air Show, that the IAF discussions had resulted in BAC implementing a venture based upon building and supplying a subsatellite as a low-cost, small self-contained payload for Shuttle launchings. BAC hopes to set itself up as a single point for these packages to be offered to European universities and researchers.

The BAC venture is based upon developing low cost and versatile subsatellites for use from the Shuttle, employing well-proven Skylark sounding rocket payload techniques. The Skylark is a BAC vehicle. BAC had a model of the subsatellite on display. Main components consisted of Skylark cylindrical body sections 17 inches in diameter, which can be clamped together to form subsatellites of any desired length. Standard bulkheads seal the ends of the package and internal "cake stand" structures are provided to mount subsystems, instruments, batteries and telemetry gear. An attachment handle compatible with the Remote Manipulation

System on the Shuttle is fitted to the end. The BAC idea is to deliver the subsatellites to experimenters in "kit form" for assembly. BAC also offers to provide a wide variety of services to a user, including analysis support, integration and testing.

BAC believes that these subsatellites can be provided at a cost of \$70,000, and can be used in fields of astronomy, geophysics, earth resources, space processing, life sciences, and meteorology. They view the package as qualifying as a 200-lb, 5-cubic foot, small self-contained payload. They have now purchased an option for flying such a package with NASA.

During the Air Show, an interesting relationship developed between BAC and the NASA team. Each group, when appropriate, escorted other country or company representatives to the other group's booth for information and discussions which proved to be mutually beneficial to NASA, BAC, and the third party involved.

An arrangement was agreed upon by NASA and BAC to have Battelle give an STS briefing in Bristol, England, on June 24, 1977, subsequent to the Air Show. The briefing consisted of the Battelle STS film, slides on the STS program status, pricing policy, and details of how a small self-contained payload can be used in space processing research. The briefing at Bristol was well attended (see Appendix B for attendees) and resulted in many detailed questions on the STS, mostly of a policy and programmatic nature. The BAC personnel were very enthusiastic in their reception and appreciation for the briefing. Prior to the meeting at the Paris Air Show, BAC felt that NASA considered their venture as too small to bother with. The events at the Air Show and the Bristol briefing demonstrated to them NASA's willingness to deal with, help and understand all users. It also demonstrated how the development of user interests involves long-term activities, since the seed for BAC's interest was planted in October 1976 at the IAF Congress. At the conclusion of the meeting it was indicated that Dave Ashford of BAC would be making a trip to the United States to follow up with detailed discussions at NASA Headquarters, GSFC and JSC.

RECOMMENDATIONS

While NASA participation at the Paris Air Show was considered to be successful and did effectively achieve pre-established goals, several compromises which occurred can be minimized for future air shows. Early and positive planning on NASA's part for participation in future air shows is essential. It was indicated by the U.S. Department of Commerce that NASA could have had one of the specially prepared exhibitor booths in the U.S. Pavilion if an early decision had been made. The late decision to participate made by NASA resulted in the NASA booth being prepared out of a corner of existing office space, which provided an out-of-the-way booth without the spotlights given to the other booths.

The U.S. Pavilion exhibits are directed primarily at the aircraft component and subsystem levels, as compared to system exhibits located elsewhere at the Air Show. During many of the days and hours of the Show, there is restricted admittance to the U.S. Pavilion except in the theme area. It is recommended that early planning consider a new location of the NASA exhibit adjacent to and with the large system exhibitors. Incidentally, the public attendance at the exhibits away from the U.S. Pavilion was considerably higher. This should be qualified by the fact that attendance at the U.S. Pavilion aircraft/space theme exhibit (showing Lindbergh's flight, Shuttle, space stations, and advanced Mars roving vehicles) was very good. That exhibit, however, was not tied into the NASA STS booth in any way. It was located in a separate access part of the building. For comparison, the USSR building was devoted to space exclusively. Another observation is that the CV-990 aircraft from NASA Ames, located in the static aircraft display area, received record crowds. Overall, every effort should be made to locate the NASA STS display in an optimum locale, taking advantage of the public's interest in systems as compared to aircraft components.

Another recommendation is, through early planning, to assure the use of briefing rooms at optimum times. An understanding of the Air Show operation readily determines that briefings at 9 a.m. will not be attended, and that even 3:30 p.m. is a gamble. It is recommended that

planning for NASA participation in the next Paris Air Show not only be early, but be done by or with individuals experienced in previous Air Show activities.

One final recommendation concerns the BAC. It is recommended that the BAC be supported in every way practical to encourage their enthusiasm and specific proposed venture. BAC can well be considered a "marketing" agent (indirectly) for the space program, NASA and the STS.

CONCLUSIONS

Based upon the results of NASA's participation in this year's Paris Air Show, it is concluded that the Air Show does, in fact, provide a unique, concentrated opportunity to promote and develop international interest in the STS. In general, operation of a booth, supply of specially prepared handout material, presentation of at least one major briefing and intermingling of the NASA team with organizations at their booths/chalets appears to be an effective mode of operation. Overall, the promotional aspect provided for the STS cannot be specifically measured, but it was extensive. Requests for material from the European press and the large number of attendees at the major briefing on June 8, 1977, were indications that, at this point in time, information beyond that available on the Spacelab is much sought after.

Similarly, the direct sales benefit from participating in the Air Show cannot be specifically measured. There were no announced sales of STS flights which can be compared to aircraft sales typically associated with and announced at the Show. On the other hand, there were no high-performance demonstrations of a vehicle which a country or airline or user could view and relate to an immediate application leading to a placed order for multiple units. Since it is not yet operational, the sales of the STS should be considered as long term, requiring cultivation and development over months if not years. The development of user interest achieved at the Paris Air Show may not result in sales of specific STS flights or use concepts for some time. The case of BAC has demonstrated how the seeds of an STS application can result several months later in development of a viable STS role by a specific organization.

It is concluded that the NASA decision to participate in the Paris Air Show was valid, the participation objectives were met and the expenditure of resources was justified. Future air show participation is recommended, optimized by earlier planning. Battelle's briefing to BAC also indicates that effective use of cost and manpower, once at the Air Show, can be made subsequently by "fanning out" to selected organizations in Europe for follow-up presentations.

APPENDIX A

LIST OF ATTENDEES AT PARIS AIR SHOW
STS PRESENTATION

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LIST OF ATTENDEES AT PARIS AIR SHOW
STS PRESENTATION

June 8, 1977
United States Pavilion
32nd Paris Air Show

1. Invitation Turned In:

H. H. Atkinson
Mr. K. Bentz
Mr. K. Bolsutromorion
Mr. H. Bortzmeyer
Mr. Bortzmeyer
Mrs. Berta Braun
Mr. J. Breton
W. Buedeler
Mr. J. Collet
M. Conrad
Dr. Dieter Davidts
Mr. Bernard Deloffre
Mr. G. Estibal
Mr. G. Giompolmo
Mr. L. Gofreville
Mr. P. LeGouellec
Mr. Hans W. Hoffmann
Mr. Jacob
Mr. Druger
Alain Labeque
Mr. Leroy
Colonel Friedrich Materna
W. A. Mittelbach
Mr. R. Moreau
Mr. P. Morel
Mr. Eric Muller
Mr. Mory
Mr. D. Netzle
Mr. C. Muller
Mr. Johannes Oriner
Mr. M. De Piccioho
Dr. Ernst Pomp
Dr. Luciano Porpora
Mr. J. C. Raison
Rottweiler
Dr. W. Schroter
Mr. Y. Sillaro
Mr. Jack Shuer
E. G. Shelor
Mr. Gustav Smith
Mr. Therman Strub
Dr. H. M. Van Der Veen
Mr. M. Ussov

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APPENDIX B

LIST OF ATTENDEES AT BRITISH AIRCRAFT CORPORATION
STS BRIEFING

APPENDIX B

LIST OF ATTENDEES AT BRITISH AIRCRAFT CORPORATION STS BRIEFING

Bristol, England - June 24, 1977

<u>NAME</u>	<u>PROJECT</u>
H. J. M. Dickenson	Marketing
D. M. Ashford	Skylark Project Office
A. Robbins	RAE Farnborough
R. H. W. Fox	B.A.C.
J. K. Ratcliffe	B.A.C. Space Project Manager
T.C. Bickerton	Publicity
G. M. Howell	Spacecraft A.I.T.
E. Stansfield	Spacecraft A.I.T.
T. A. Green	Skylark A.I.T.
S. R. Starr	Communications Systems Analysis
P. F. Braund	Space Systems
R. W. Parker	B.A.C. Space Systems Management
R. S. Finnegan	B.A.C. Space Systems
P. R. Jones	B.A.C. Space Systems
H. McD Mooney	B.A.C. Space Systems Engineering
R. Bushill	B.A.C. Space Systems Engineering
M. J. Brewer	B.A.C. Space Systems Engineering
C. Ashman	S.P.S.K.
D. J. Brown	B.A.C. SUBSAT Project Designer
M. J. Hammond	Systems Design
T. H. Russell	Drawing Office
D. M. Crosse	Space Systems Engineering
D. O. Fraser	Marketing Mgr. Electronics and Space Systems
D. N. Hoare	Mkt. Mgr. (Sounding Rockets)
F. T. Maddison	P. A. Manager
J. L. Bone	ESS Management Information
B. S. E. Beattie	Chief Project Manager Skylark
J. L. Crowder	Chief Systems Engineer